CLAIMS

1. A support intended for observing between crossed polarisers an object placed on the support or in the vicinity thereof in a medium (3) of index n_0 with spatially incident convergent incoherent illumination under an angle θ_0 at a wavelength λ, including

- a substrate (1) of complex refraction index n_2,
- a layer (2) of complex refraction index n_1 and of thickness e_1

characterised in that,

the value of the thickness e_1 of the layer (2) is within 2 % so that:

$$\frac{d^2}{de_1^2}\ln|\sigma|^2 = 0$$

with

$$\sigma = \frac{\sigma_{01} + \sigma_{12}(1+\pi_{01})e^{(-2j\beta_1)} + \sigma_{01}\pi_{12}e^{(-4j\beta_1)}}{(1+r_{01(p)} + r_{12(p)}e^{(-2j\beta_1)})(1+r_{01(s)}r_{12(s)}e^{(-2j\beta_1)})}$$

a formula wherein σ_{ij} and π_{ij} represent respectively the sum and the product of the Fresnel coefficients of the different interfaces [(i,j)=(0,1) or (1,2)] :

$$r_{ij(p)} = \frac{n_j\cos\theta_i - n_i\cos\theta_j}{n_j\cos\theta_i + n_i\cos\theta_j}$$

and

$$r_{ij(s)} = \frac{n_i\cos\theta_i - n_j\cos\theta_j}{n_i\cos\theta_i + n_j\cos\theta_j}$$

and wherein $\beta_1 = \frac{2\pi n_1 e_1\cos\theta_1}{\lambda}$,

with $\cos\theta_1 = \sqrt{1-\left(n_0/n_1\right)^2\sin^2\theta_0}$.

2. A support intended for observing between crossed polarisers an object placed on the support or in the vicinity thereof in a medium (3) of index n_0 with incident convergent incoherent illumination under an angle θ_0 at a wavelength λ, including

- a substrate (1) of complex refraction index n_2,

- a layer (2) of complex refraction index n_1 and of thickness e_1

characterised in that,

the value of the thickness e_1 of the layer (2) is within 2 % so that:

$$\frac{d}{de_1}\left|\sigma^2\right| = 0$$

with

$$\sigma = \frac{\sigma_{01} + \sigma_{12}(1+\pi_{01})e^{(-2j\beta_1)} + \sigma_{01}\pi_{12}e^{(-4j\beta_1)}}{(1+r_{01(p)} + r_{12(p)}e^{(-2j\beta_1)})(1+r_{01(s)}r_{12(s)}e^{(-2j\beta_1)})}$$

a formula wherein σ_{ij} and π_{ij} represent respectively the sum and the product of the Fresnel coefficients of the different interfaces [(i,j)=(0,1) or (1,2)]:

$$r_{ij(p)} = \frac{n_j \cos\theta_i - n_i \cos\theta_j}{n_j \cos\theta_i + n_i \cos\theta_j}$$

and

$$r_{ij(s)} = \frac{n_i \cos\theta_i - n_j \cos\theta_j}{n_i \cos\theta_i + n_j \cos\theta_j}$$

and wherein $\beta_1 = \frac{2\pi n_1 e_1 \cos\theta_1}{\lambda}$, with $\cos\theta_1 = \sqrt{1-\left(n_0/n_1\right)^2 \sin^2\theta_0}$.

3. A support intended for optimising the useful extinction coefficient of a polarising microscope for observing an object placed on the support or above the support in a medium (3) of index n_0 with incident convergent incoherent illumination under an angle θ_0 at a wavelength λ, including

- a substrate (1) of complex refraction index n_2,
- a layer (2) of complex refraction index n_1 and of thickness e_1

characterised in that,

the value of the thickness e_1 of the layer (2) is within 2 % so that:

$$\frac{d}{de_1}\left(\frac{|\sigma|^2}{R_{NP}}\right) = 0$$

with

$$R_{NP} = \frac{1}{4}\left|r_p + r_s\right|^2 + \frac{1}{4}\left|r_p - r_s\right|^2$$

and

$$r_p = \frac{r_{01(p)} + r_{12(p)}e^{(-2j\beta_1)}}{1 + r_{01(p)}r_{12(p)}e^{(-2j\beta_1)}} \quad \text{and} \quad r_s = \frac{r_{01(s)} + r_{12(s)}e^{(-2j\beta_1)}}{1 + r_{01(s)}r_{12(s)}e^{(-2j\beta_1)}}$$

and

$$\sigma = r_p + r_s = \frac{\sigma_{01} + \sigma_{12}(1+\pi_{01})e^{(-2j\beta_1)} + \sigma_{01}\pi_{12}e^{(-4j\beta_1)}}{(1 + r_{01(p)} + r_{12(p)}e^{(-2j\beta_1)})(1 + r_{01(s)}r_{12(s)}e^{(-2j\beta_1)})}$$

a formula wherein σ_{ij} and π_{ij} represent respectively the sum and the product of the Fresnel coefficients of the different interfaces [(i,j)=(0,1) or (1,2)]:

$$r_{ij(p)} = \frac{n_j \cos\theta_i - n_i \cos\theta_j}{n_j \cos\theta_i + n_i \cos\theta_j}$$

and

$$r_{ij(s)} = \frac{n_i \cos\theta_i - n_j \cos\theta_j}{n_i \cos\theta_i + n_j \cos\theta_j}$$

and wherein $\beta_1 = \frac{2\pi n_1 e_1 \cos\theta_1}{\lambda}$, with $\cos\theta_1 = \sqrt{1 - \left(n_0/n_1\right)^2 \sin^2\theta_0}$.

4. A support according to claim 1 or 2 or 3, characterised in that the values of the refraction index n_1 and of the thickness e_1 of the layer (2) are within 2 % such that:

$$\sigma = 0$$

5. A support according to claim 4, characterised in that the substrate (1) and the layer (2) are dielectric or little absorbent, the module of the imaginary portion of their complex index being smaller than 0.01, the general conditions of the claim 4 being reduced to the conditions:

$$n_1 e_1 \cos\theta_1 = \frac{\lambda}{4} + k\frac{\lambda}{2}$$

and

$$n_1^2 = \frac{n_2^2 + \sqrt{n_2^2 \cos^2\theta_0 (n_2^2 - n_0^2 \sin^2\theta_0)}}{n_2^2 + n_0^2 \cos^2\theta_0}$$

with *k* integer and with an uncertainty of 2 % on the values of n_1 *and* e_1

6. A support according to claim 5, characterised in that θ_0 is smaller than 5°, the general conditions of the claim 4 being reduced to

$$\frac{2}{n_1^2} = \frac{1}{n_0^2} + \frac{1}{n_2^2}$$

and

$$n_1 e_1 \cos\theta_1 = \frac{\lambda}{4} + k\frac{\lambda}{2}$$

with *k* integer and with an uncertainty of 2 % on the values of n_1 *and* e_1.

7. A support according to any of the claims 1 to 4 or 5 to 6, characterised in that it is intended for use with annular incident illumination with an angle of incidence θ_0 which is unique within ± 2.5°.

8. A support according to any of the claims 1 to 4 or 5 to 6, characterised in that it is intended for use in incident and convergent axial illumination with an average angle of incidence θ_0 associated with its total angular opening $\Delta\theta_0$ by the relation :

$$\cos\theta_0 = \cos^2\left(\frac{\Delta\theta_0}{2}\right)$$

9. A support according to any of the claims 1 to 8, characterised in that the illumination is monochromatic or quasi-monochromatic at the wavelength λ.

10. A support according to any of the claims 1 to 9, characterised in that the illumination has a continuous wide spectrum or is polychromatic with maximum span ± 0.3 λ around its average wavelength λ.

11. A support according to any of the claims 1 to 4 and 7 to 10, intended for use in the air as a surrounding medium (3), with θ_0 = 30° and λ = 589.3 nm, characterised in that the substrate (1) is made of cadmium with n_2 = 1.13-5.01j, the layer (2) having an index n_1 = 1.42 and e_1 = 1084 Angströms.

12. A support according to any of the claims 1 to 4 and 7 to 10, characterised in that the substrate (1) and the (2) have the specificities of the following table wherein n_1 and e_1 are the index and the thickness of the layer, n_2 the complex refraction index of the substrate (1), in the air as a surrounding medium (3), θ_0 = 5° and λ= 540 nm

Substrate	n_2	n_1	e_1(Å)
Gold	0.40 – 2.6*j*	1.70	694
Silver	0.13 – 3.44*j*	1.59	795
Aluminium	0.92 – 0.95*j*	2.01	346
Nickel	1.76 – 3.2*j*	1.51	847

13. A support according to any of the claims 1 to 4 and 7 to 10, characterised in that θ_0 is an average angle of incidence equal to 20° and in that the substrate (1) and the layer (2) have the specificities of the following table wherein n_1 and e_1 are the index and the thickness of the layer (2), n_2 the complex refraction index of the substrate (1), in the air as a surrounding medium (3) and λ = 540 nm.

Substrate	n_2	n_1	e_1(Å)
Gold	0.40 – 2.6*j*	1.64	739
Silver	0.13 – 3.44*j*	1.55	838
Aluminium	0.92 – 0.95*j*	1.89	399
Nickel	1.76 – 3.2*j*	1.48	890

14. A support according to any of the claims 1 to 4 and 7 to 10, characterised in that θ_0 is equal to 5° and in that the substrate (1) and the layer (2) have the specificities of the following table wherein n_1 and e_1 are the index and the thickness of the layer (2) within 2 %, n_2 the complex refraction index of the

substrate (1), n_0 the index of the surrounding medium (3) , λ= 589,3 nm when the layer (2) is made of cadmium and λ= 540 nm in the other cases.

Substrate	n_2	n_0	n_1	e_1
Gold	0.40 – 2.6*j*	1.33	2.42	490
Gold	0.40 – 2.6*j*	1.5	1.79	755
Silver	0.13 – 3.44*j*	1.33	2.28	512
Silver	0.13 – 3.44*j*	1.5	2.7	412
Aluminium	0.92 – 0.95*j*	1	1.89	399
Nickel	1.76 – 3.2*j*	1.33	2.11	572
Nickel	1.76 – 3.2*j*	1.5	2.45	473
Cadmium	1.13-5.01j	1	1.49	970
Cadmium	1.13-5.01j	1.33	2.05	684
Cadmium	1.13-5.01j	1.5	2.36	582
Tin	1.48-5.25j	1	1.48	899
Tin	1.48-5.25j	1.33	2.02	640
Tin	1.48-5.25j	1.5	2.33	548
Copper	1.04-2.59j	1	1.62	746
Copper	1.04-2.59j	1.33	2.23	423
Copper	1.04-2.59j	1.5	2.83	351
Iron (evaporated)	1.51-1.63j	1	1.54	737
	1.51-1.63j	1.33	2.23	423
	1.51-1.63j	1.5	2.72	305

15. A support according to any of the claims 1 to 10, characterised in that the parameters defined by the claims 11 to 14 are kept with the exception of the wavelength λ and of the thickness e_1 of the layer 2 which are modified proportionally, $\frac{e_1}{\lambda}$ not being modified.

16. An accessory intended for observing a preferably liquid sample formed of a Petri dish and of a support intended for receiving said sample, characterised in that:

- the support complies with any of the claims 1 to 15,
- the support is the bottom of this dish.

17. A device for observing a sample including an optical microscope, a support intended for receiving said sample and two crossed polarisers, characterised in that the support complies with any of the claims 1 to 15.

18. A device for observing a sample including an optical microscope, an accessory intended for receiving said sample and two crossed polarisers, characterised in that the accessory complies with the claim 16.

19. A device for observing a sample including an optical microscope, a support intended for receiving said sample, a polariser and a quarter-wave blade, characterised in that the support complies with any of the claims 1 to 15.

20. A device for observing a sample including an optical microscope, an accessory intended for receiving said sample, a polariser and a quarter-wave blade, characterised in that the accessory complies with claim 16.

21. A device for observing a sample according to claim 16 or 17 or 18, characterised in that the optical microscope is fitted with a differential interferential contrast device.